

**Pay Item**  
 Prestressed Beams  
 Concrete

**Pay Unit**  
 Linear Foot  
 Cubic Yard

This payment will be full compensation for all labor, equipment, and materials necessary to complete the work.

## SECTION 606 PRECAST REINFORCED CONCRETE BOX CULVERTS

### 606.01 DESCRIPTION.

This work consists of furnishing required materials as well as fabricating, transporting, and installing precast reinforced concrete box culverts.

### 606.02 MATERIALS.

Prestressing strands, wire, and bars shall meet Section 836.03E.

Geotextile fabric shall meet Section 709.

### 606.03 DESIGN AND MANUFACTURE.

The design and manufacture of the precast RCB shall satisfy the applicable portions of *AASHTO Standard Specifications for Highway Bridges*, Division I, Section 17, and "AASHTO Materials Specification M259." The design shall also meet or exceed the following criteria:

#### A. Live Load. HS25

#### B. Load Factor Design.

1. Dead Load Factor = 1.30
2. Live Load Factor = 2.17
3. Strength Reduction (Phi) Factors
  - a. Shear = .85
  - b. Flexure = .9

#### C. Dead Loads.

1. Concrete = 150 lbs./cu. ft.
2. Earth = 120 lbs./cu. ft.
3. Lateral Earth = 40 lbs./sq. ft./ft. of depth

D. **Applications of Loads.** The RCB shall be designed for the greater moments and shears resulting from the following two load conditions:

1. Dead Load + Live Load + Balanced Lateral Earth Load
2. .8 x (Dead Load + Live Load + Unbalanced Lateral Earth Load). The unbalanced lateral earth load occurs when one side of the culvert has 40 lbs./sq. ft./ft. of depth while the other side has 20 lbs./sq. ft./ft. of depth.

The precast RCB shall be comprised of barrel sections and end sections. The concrete used to make the sections shall have a minimum compressive strength of 3,000 psi and shall have a minimum cement content of 6 sacks per cubic yard.

The barrel sections shall not be any shorter than 4 feet long. The minimum thickness of the barrel parts are 8 inches for the roof, floor and walls. Any haunch or fillet at the inside corners of the barrel shall not exceed a triangular shape with 12-inch horizontal and 12-inch vertical legs. The barrel section joints shall be tongue and groove, a minimum of 4 inches long and a width of 3 1/2 inches at the end of the tongue.

#### **606.04 CONSTRUCTION REQUIREMENTS.**

The Contractor shall submit shop drawings to the Engineer for approval before the manufacture of the RCB sections. These shop drawings shall show a minimum of the following:

- A. Layout showing RCB placement and clearances.
- B. Type and strength of concrete and reinforcing steel.
- C. All concrete and reinforcing dimensions.
- D. Reinforcing steel clearances.
- E. Method of tying sections together.
- F. Method of covering the joints.
- G. Installation and handling instructions.

The Contractor must give at least 10 working days notification to the district materials coordinator of the date and location of fabrication.

The installation of the precast RCB shall satisfy the applicable portions of *AASHTO Standard Specifications for Highway Bridges*, Division II, Section 27 and Section 210 of the NDDOT's *Standard Specifications for Road and Bridge Construction*. The backfill shall be compacted to 85% standard density per AASHTO T-180. The Contractor shall provide a 2-inch minimum thickness of uncompacted (screedable) fine

granular material under the RCB for a leveling course. This fine granular material shall not be paid for separately but shall be incidental to the bid item "Precast RCB Culvert."

The joints should fit as tightly as possible, with a maximum of 1 inch between barrel sections.

The four outside surfaces of each barrel section joint shall be wrapped with a geotextile fabric that prevents soil from leaking through the joint. The geotextile fabric shall be a minimum of 24 inches wide and shall meet the requirements of Geotextile Separation Fabric of section 709 of the "North Dakota Supplemental Specifications." Geotextile fabric shall also be required at the outside face of each cutoff wall vertical joint, if more than one unit is used.

The costs of providing and installing the strands and the geotextile fabric to wrap the barrel shall be incidental to the precast RCB.

#### **606.05 METHOD OF MEASUREMENT.**

Precast reinforced concrete box culverts will be measured by the linear foot complete and in place.

Precast reinforced concrete box culvert end sections will be measured by the unit complete and in place.

All hardware embedded in the reinforced concrete box culverts and end sections, all prestressing strands, hardware, bolts, and steel plates used to fasten the barrel sections and end sections together shall be incidental to the item "Precast Reinforced Concrete Box Culvert" and the item "Precast Reinforced Concrete Box Culvert End Section."

#### **606.06 BASIS OF PAYMENT.**

Payment will be made at the contract unit price as follows:

<b>Pay Item</b>			<b>Pay Unit</b>
Single _____	x	_____ Precast RCB culvert	Linear foot
Double _____	x	_____ Precast RCB culvert	Linear foot
Single _____	x	_____ Precast RCB culvert end section	Each
Double _____	x	_____ Precast RCB culvert end section	Each

## **SECTION 612 REINFORCING STEEL**

#### **612.01 DESCRIPTION.**

This work consists of furnishing and placing reinforcing steel.